



# Prof. Lal Visits Indian Institute of Soil Science, Bhopal

Issue 1:2014



**INDIAN INSTITUTE OF SOIL SCIENCE**  
(INDIAN COUNCIL OF AGRICULTURAL RESEARCH)

Prof. Lal visited the Indian Institute of Soil Science from 10<sup>th</sup> to 13<sup>th</sup> March 2014. The visit was to learn about the research being done by IISS and strengthen cooperation on themes of mutual interest. Two senior scientists of IISS were visiting scholars at C-MASC. Dr. N. Lenka was awarded the Borlaug Fellowship and Dr. Pramod Jha the NAIP/ICAR Fellowship. We look forward to receiving more scientists from IISS and other research institutes of ICAR. A visit to the field experiments at IISS was organized by Dr. Muneshwar Singh (extreme left), the Acting Director of IISS. Dr. Lenka, former visiting scholar at C-MASC, is on the extreme right.



## Featured Article: “Soil and Sanskriti”

Prof. Lal’s article “Soil and Sanskriti” was the featured article in the Journal of the Indian Society of Soil Science, December 2013 issue (Volume 61, Number 4, pages 267-274) with a figure entitled “Technological Innovations Towards Climate Resilient & Sustainable Intensification of Agriculture” from his article gracing the cover.

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## Visiting Scholars - An Integral Component of C-MASC



**Dr. Subir Kumar Nag**  
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October 2013 – January 2014



Dr. Subhir Kumar Nag is a Principal Scientist at the Fishery Resource & Environmental Management Division, Central Inland Fisheries Research Institute (CIFRI), Barrackpore, India studying under scholarship from National Agricultural Innovation Project (NAIP) of Indian Council of Agricultural Research, DARE Ministry of Agriculture, Government of India.

While a visiting scholar at C-MASC he conducted studies on carbon sequestration potential and GHG emission from wetlands at the Wilma H. Schiermeier Olentangy River Wetland Research Park, SENR, OSU. These studies included research on greenhouse gas emission and carbon sequestration in open water and vegetative wetlands compared with reference upland on the fringe of the wetland.

Samples for gas emission (methane, carbon dioxide, nitrous oxide), measurement samples from water surface of wetlands and samples of upland soil were taken on weekly basis for nine consecutive weeks. Sediment and soil samples were also taken from different depths (10, 20, 30 cm) for C and N analysis. Water samples from the wetland were also analyzed for DOC.

Lab analysis techniques learned include gas sampling techniques from water and soil surface and their analysis.

The Fishery Resource & Environmental Management Division, at the Central Inland Fisheries Research Institute, Barrackpore, is already working on carbon sequestration in wetlands. During his visit at C-MASC, Dr. Nag learned the technique of GHG emission measurement from wetlands and also few other important aspects of C-sequestration studies which will be of immense help for their future work.

Dr. Nag would be very happy to have future collaborations with Dr. Lal and C-MASC for future research, publications and visits.





### Visiting Scholars - An Integral Component of C-MASC



**Dr. Anup Das**  
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October 2013 – January 2014



भा कृ अनुप - पु प सं  
ICAR - RCNEH

Dr. Anup Das, Senior Scientist, Agronomy, ICAR Research Complex for North Eastern Hill Region, Meghalaya, India joined C-MASC, OSU, as a short-term visiting scholar from 15 Oct, 2013 to 14 Jan, 2014. He was on deputation to C-MASC, OSU, as a part of Lal Bahadur Shastri Outstanding Young Scientist Award of ICAR, New Delhi. Considering the importance of renewable energy, soil quality and mitigation of greenhouse gas emission, Dr. Das did his short-term research on “Impact of biofuel crops on soil carbon storage and properties”. Soil and plant sampling was done from an ongoing two year old field trial at Waterman Farm. Results indicated substantial improvement in soil properties in terms of lower soil bulk density ( $\rho_b$ ), higher porosity, improved water stable aggregates (WSA), mean weight diameter (MWD), pH and  $E_c$  under lignocellulosic biofuels such as switchgrass and miscanthus than those under corn and sorghum. Total WSA was significantly higher ( $P=0.05$ ) under miscanthus (94.7 and 91.8%) and switchgrass (92.7 and 89.4%) compared to those that under corn (89.9 and 86.1%) and sorghum (85.1 and 85.4%) in 0-10 and 10-20 cm soil layers, respectively. Soil properties under prairie mix didn't not follow any conclusive trends. Macroaggregates in soil under sorghum and corn contained 17.3 and 14.2% less C and 22.8 and 15.2% less N in 0-10 cm layer; and 29.8 and 24.2 % less C and 22 and 7.1 % less N in 10-20 cm layer than that under switchgrass, respectively. The stratification ratio under all the biofuel crops was more than 1 indicating deposition of nutrients in surface layer. In terms of SOC stock, only switchgrass (1.33 and 2.81 Mg/ha in 0-10 cm layer) and miscanthus (1.06 and 2.11 Mg/ha in 10-20 cm Mg/ha) had positive C-sequestration and others had depletion (0.42 to 0.95 Mg in 0-10 cm and 1.13 to 1.26 Mg/ha in 10-20 cm layer) over the antecedent levels. Thus, there is need for long-term study to establish the SOC balance under biofuel crops.

The research experience, specially soil and plant sampling and laboratory techniques on analyzing soil physical parameters enhanced the capacity of Dr. Das in natural resource management. Laboratory techniques of analyzing soil aggregate stability by wet sieving and soil carbon analysis using CHN analyzer and GHG monitoring through Photoacoustic system (PAC) were some of the new exposure for Dr. Das. Utilizing the opportunity of quality guidance of Dr. Rattan Lal, Director, C-MASC (Host research advisor of Dr. Das), a good library and literature availability, Dr. Das prepared a couple of manuscripts from his earlier works for publication in reputed journals. A manuscript on his research works in C-MASC, OSU is under final stage of preparation.

During his 3 months program, Dr. Das actively participated in activities such as attending departmental seminars, OIA activities (India gateway program, visit to Columbus zoo, COSI, etc.), classes on soil physics, visited research and eco-restoration activities in Coshocton and Wilds (Miller valley). Dr. Das is confident that this short term exposure on advance research experience would help him in shaping his future research career through effective planning and execution. Some of the potential areas of collaboration with C-MASC, OSU, are C-sequestration and GHG emission studies in degraded soils of northeastern hill region of India, soil quality management, small holders farming etc. Dr. Das sincerely acknowledges OSU, USA and ICAR, New Delhi for extending needed support to complete the program at CMASC, OSU.





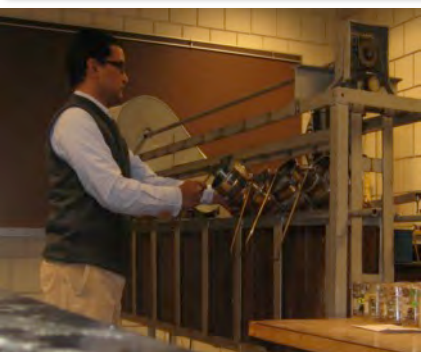
## Visiting Scholars - An Integral Component of C-MASC



**Dr. Venkatesh M.S.**

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[msvenkatipr@gmail.com](mailto:msvenkatipr@gmail.com)

September 2013 –  
 December 2013



Dr. Venkatesh M.S.'s program was sponsored by National Agricultural Innovation Project (NAIP) of Indian Council of Agricultural Research (ICAR) on theme "carbon trading/carbon sequestration/ climate change (Natural Resource Management)". The topic of research work conducted was "Impact of conservation tillage and cover cropping under corn-soybean rotation on soil carbon fractions in an Alfisol of Central Ohio". Soil samples were collected from the Ohio Agricultural Research and Development Center (OARDC) research farm in Wooster, Ohio. There were in total 24 treatments from which 6 treatments were selected with the combinations of corn-corn, corn-soybean, conservation tillage, no tillage, cover cropping and no cover cropping with four replications. Likewise, 24 surface (0-10 cm) soil samples were collected (both core sample as well as bulk soil sample) for the analysis of bulk density, soil carbon and nitrogen stock, aggregate stability and aggregate associated carbon. Soil samples were dried under shade, ground to pass through nest of sieves viz., 8, 4.75 and 2 mm for the analysis of aggregate stability and soil properties like pH, EC, CEC etc. and stored in air tight polybags for analyses. The aggregate stability was analyzed by wet sieving method using Yoder apparatus. The different aggregate fractions were collected in nest of sieves of size 4.75, 2, 1, 0.5 and 0.25 mm, dried at 40°C and weighed to compute mean weight diameter (MWD) and geometric mean diameter (GMD). Sub samples of each aggregates was mixed together to represent 2 aggregate size fractions, macro (>0.25 mm) and micro (<0.25 mm) aggregates. The particulate organic carbon (POC) (0.053 - 2 mm) was extracted in 20 g air dry soil with 60 ml sodium hexa metaphosphate (5g/lit) and shaken overnight for 16 hours in end to end shaker. The soil suspension was passed through 0.053 mm sieve, rinsed and washed to pre-weighed beakers and oven dried at 40°C. Dried mass of these fractions of macro, micro and POC were ground to passed through 0.25 mm sieve and used for analysis of C and N by dry combustion method using CN Analyser (Elementar, Vario Max CN, Hanau, Germany). The SOC was assumed to be equal to total C with negligible inorganic carbon concentration as the pH was below 7.0 (Jagadamma and Lal, 2010). The SOC pool was calculated using bulk density for surface depth as: SOC pool (Mg/ha) = C content (Kg/Mg) x Bulk density (Mg/m<sup>3</sup>) x Depth (m) x 10<sup>-3</sup> Mg/kg x 10<sup>-4</sup> m<sup>2</sup>/ha. The basic soil properties before start of experiment and also the yield data of current growing season were collected from the investigators. The statistical analysis of data was done using SAS 9.2 for Windows (SAS Institute, CARY, North Carolina).

Dr. Venkatesh presented his seminar to the C-MASC group on 5th December 2013. The results of my research work conducted at C-MASC have been compiled in tabular and graphical forms. The related references have been collected. The manuscript preparation for research paper publication is under progress. I have collected protocols of analysis of different carbon fractions in soils for reference. I am also in progress of writing one review article on "Legume effect on soil carbon sequestration".

The following experiences were arranged by C-MASC during Dr. Venkatesh's stay at OSU.

- Visited all the C-MASC experiments at Waterman farm, OSU.
- Experience gained in field level monitoring of GHGs (CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O) by photo-acoustic infrared spectroscopy (PAS).
- Collected soil samples from OARDC research farm at Wooster for his research study.
- Visited Coshocton farm and viewed the Coshocton wheel and Lysimeter.
- Visited The Wilds, a wildlife conservation center located in Muskingum county, Ohio
- In laboratory, he was acquainted with different sophisticated equipment like CN Analyser, TOC analyzer, Yoder apparatus, Centrifuge etc. including the soil sample preparation and processing. Different parameters like C and N analysis, Aggregate stability, MWD, GMD, Carbon in aggregate and particulate organic carbon have been analyzed. Some samples have also been analyzed for light and heavy fractions of soil organic carbon (density fractionation using sodium poly tungstate).
- Exposed to SAS 9.2 for Windows for statistical analysis of data.
- Attended C-MASC's Thursday seminars and also a few classes of soil chemistry by professor Dr. Nick Basta and classes of Soil Taxonomy by Prof. Dr Brian Slater

There is a legume based long-term experiment at IIPR, Kanpur which started during the year 2003. In this experiment, there are different cropping systems under different nutrient management practices like control (no fertilizer), Inorganic fertilizers (NPKS Zn and B), and Integrated (50% inorganic + 50% organic i.e., crop residues+bio-fertilizers+Farm Yard Manure). Application of the knowledge acquired at C-MASC to assess the long-term impact of these treatments on aggregate stability, soil physical fractionation of organic carbon like aggregated associated carbon, particulate organic carbon, light and heavy fractions of organic carbon in the soils will be most helpful. Soil carbon stock in soils will be calculated to recommend the best cropping system and nutrient management on the basis of soil carbon stability.

The experience gained at C-MASC will help Dr. Venkatesh to assess carbon stock in soils under various land use systems in India such as agriculture, horticulture, plantation crop, forestry, grassland and pastures under different agro-ecological regions by collaborating with various other ICAR institutes.





# Visiting Scholars - An Integral Component of C-MASC



Dr. Debashis Mandal is a Senior Scientist at Central Soil & Water Conservation Research & Training Institute (CSWCRTI), Dehradun, India, studying under scholarship from National Agricultural Innovation Project (NAIP), ICAR, India.

During his visit to C-MASC, Dr. Mandal researched soil erosion and carbon dynamics, specifically, the role of topsoil depth on gaseous emission. He also prepared a synopsis of the research work carried out at C-MASC.

Dr. Mandal was able to prepare a research article draft entitled "The threat of soil erosion to soil quality and agricultural sustainability in north-western Himalayan region of India". Presently, he is writing a review article on topsoil properties and gaseous emission.

His field work while at OSU included research conducted at Waterman Farm, OSU, on the scalping plots with different topsoil depth (TSD). Weekly observations were taken on emission of ammonia (NH<sub>3</sub>), nitrous oxide (N<sub>2</sub>O) and carbon-di oxide (CO<sub>2</sub>) on the existing soybean crop. Each time soil moisture and temperature from two different depths were recorded. Soils from 9 selected treatments were sampled for soil moisture study during 29<sup>th</sup> Sept. 2013 to 4<sup>th</sup> December, 2013. Soil samples were also collected from the experimental area to study the impact of topsoil depth on soil quality and agronomic yield.

Dr. Mandal was able to learn data monitoring technique with the help of a Photoacoustic Spectrometer (PAS) in closed chambers installed in different plots. In addition, he attended a demonstration of Gas Chromatographic technique for gas analysis.

Dr. Mandal feels that the knowledge gained through the research study conducted at C-MASC will greatly help with similar projects, to be able to monitor potential of various gases emitted from soils at different phases of erosion. It will also help with new research projects on the benefits of soil conservation measures with respect to carbon dynamics and radiative gas emission.

Presently, Dr. Mandal works in the CSWCRTI, Dehradun, focusing on natural resource management (NRM). This institute hopes to collaborate with C-MASC to carry out some inter-country level study on similar subjects.

**Dr. Debashis Mandal**

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September 2013 –  
December 2013





## Visiting Scholars - An Integral Component of C-MASC



**Asma Hassan**

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August 2013 – January 2014



Asma Hassan is a Ph.D scholar in Soil Science & SWC department from PMAS-Arid Agriculture University, Rawalpindi, Pakistan, studying under scholarship from Higher Education Commission of Pakistan. She was a visiting scholar at C-MASC, from 1st August 2013 to 31 January 2014 under the supervision of Dr. Lal. While here she completed four manuscripts which are the part of her thesis. The manuscripts are as follows:

1. Active Soil Organic Carbon Fractions and Aggregate Stability As Influenced By Minimum Tillage and Crop Rotations on a Marginal Dryland Soil in Punjab, Pakistan
2. Depth Distribution Of Soil Organic Carbon Fractions In Relation To Tillage and Cropping Sequences In Some Dry Lands Of Punjab, Pakistan
3. Tillage Effect On Partial Budget Analysis Of Cropping Intensification Under Dryland Farming In Punjab, Pakistan
4. Ecosystem Carbon Sustainability In Dry Land Of Punjab, Pakistan

Asma also visited the Coshocton field research site and had a chance to see the lysometer and USDA research experiments located there. She was also able to visit to 2013 Farm Science Review where she learned about new instruments and farm management. A trip with Dr. Gerald Allen, postdoctoral researcher at C-MASC, to the WILDS in Muskingum County was another great opportunity to observe the surface water runoff and soil erosion experiments there along with the wild animals ([www.thewilds.org/](http://www.thewilds.org/)). Asma was able to learn the TDR moisture sensor installation in field and also the gas (CO<sub>2</sub>) measurement in field during a visit to Zanesville, one of C-MASC's research sites.

Asma says she feels lucky to have had the opportunity to study at C-MASC. While here, she was able to sit in on Dr. Lal's classes "Soil Physics" and "Climate Change", Dr. Basta's class "Soil Chemistry" and Dr. Brian Slater's class of "Soil Morphology". She is very happy for the chance to meet the many scientists and scholars here, and looks forward to collaborating with them in the future. Asma hopes to have the chance to visit C-MASC and OSU again.







## Visiting Scholars - An Integral Component of C-MASC



**Dr. Fanqiao  
Meng**

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December 2013 –  
January 2014

Dr. Fanqiao MENG is an associate Professor in College of Resources and Environmental Sciences, China Agricultural University. His trip to CMASC, OSU was supported by two research projects funded by National Natural Science Foundation of China (No. 30870414 and 30970533).

During his 2 months stay in OSU, Fanqiao MENG had the chance to attend the 2014 AGU Fall Meeting from Dec 9-14, 2013. He gave a presentation titled Impact of Fertilization and Tillage Management on Soil Organic and Inorganic Carbon Storage under Wheat-Maize Cropping System in a Semihumid Region in the conference. The meeting has about 25,000 attendants. From the meeting, Dr. MENG has gain wider and deeper understanding of soil carbon research worldwide and built good connection with colleagues in the soil world. He also visited experiment stations of OSU, i.e., Wooster campus, North Appalachian Experiment Watershed and Waterman Farm Experiment Station in Columbus. He learned and understood the GHG sampling and analysis methods being adopted by the research team.

During the 2 months, he tried to compare the farming system and carbon cycling in North China Plain (NCP) and Midwestern US (MW US). The research findings and technologies gained in MW US during the past decade on farming practices aiming C sequestration will help Dr. MENG to have more sound and feasible studies when he comes back to China. Under the guidance of Prof. Rattan Lal, Dr. MENG also worked on data analysis and manuscript writing, aiming to share the C sequestration stories with other colleagues. He is also keen to continue to work with Prof. Rattan Lal's team on C issues in agro-ecosystems in the future. He welcomes the visit from Prof. Rattan Lal's team and other scientists to China which can be financially supported by research projects in China.





## Visiting Scholars - An Integral Component of C-MASC



**Dr. Pramod Jha**

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December 2013 –  
March 2014



Dr. Pramod Jha is a Senior Scientist from the Division of Soil Chemistry & Fertility, Indian Institute of Soil Science, Bhopal, India studying under scholarship from National Agricultural Innovation Project (NAIP), Indian Council of Agricultural Research (ICAR).

While at C-MASC, he worked on “Long-Term Corn Stover Impacts on Soil carbon Stability and GHGs emission of No-Till Corn in Ohio”.

He performed the following analyses and learned the following techniques:

- Total carbon and nitrogen of the bulk soil
- Aggregate fractionation of soil under different level of stover retention
- Determination of soil carbon in labile and recalcitrant forms
- Measurement of greenhouse gases (eg. CH<sub>4</sub>, N<sub>2</sub>O, CO<sub>2</sub>).
- Handling of photo-acoustic spectrometry
- Handling of mass spectrometry for <sup>13</sup>C abundance analysis
- Sample preparation for <sup>13</sup>C abundance analysis.

As part of his research and training at C-MASC he also performed the following activities:

- He attended weekly seminars of the research group.
- He presented seminars entitled “Long-Term Corn Stover Impacts on Soil carbon Stability and GHGs emission of No-Till Corn in Ohio”
- He also attended SENR courses “Soils and Climate Change” and “Environmental Soil Physics” taught by Dr. Rattan Lal
- He visited the experimental farm of North Appalachian Experimental Watersheds (NAEW) near Coshocton at The Ohio Agricultural Research and Development Center (OARDC).
- He wrote a manuscript entitled “Effects of carbon input on soil carbon stability and nitrogen dynamics”.

The study conducted at C-MASC helped him develop new knowledge and techniques on soil carbon research. The knowledge gained at C-MASC will enriched Dr. Jha’s knowledge on mechanism of soil carbon stability and greenhouse gas emissions under the practice of no till system.







## Visiting Scholars - An Integral Component of C-MASC



**Dr. Samanpreet Kaur Baweja**

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January 2014 – March 2014

Dr. Baweja, Assistant Research Engineer at Punjab Agricultural University, Ludhiana, India visited C-MASC from 15<sup>th</sup> January to 15<sup>th</sup> March 2014, to upgrade her skills on use of Geo-informatics for Natural Resource management. She was studying under scholarship from the National Agricultural Innovation Project (NAIP), ICAR, India. She worked on spatial and temporal variability of carbon emissions from groundwater pumping in different districts of Punjab State. Under the guidance of Dr. Lal, she is preparing a manuscript which will be submitted soon. Dr. Baweja had hands on experience on using ERDAS IMAGINE software with the help of Dr. Alexis Londo, Director for Applied Geospatial Analysis and Remote Sensing. Dr. Baweja also worked on forest land change detection in South Eastern Ohio using satellite (LandSat) imageries in ERDAS IMAGINE software.

Dr. Samanpreet feels very fortunate to have been a visitor at C-MASC and was motivated by Dr. Lal's work culture. She enjoyed attending Dr Lal's Soil Physics (ENR-5261) and Soils and Climate Change (ENR-5268) classes. Dr. Baweja gained further knowledge from the visits to experiments at the WILDS and long-term no-tillage experiments at Wooster Campus.

She was happy to meet the many scientists and scholars here, and she looks forward to collaborating with them in the future. She also hopes to have chance to visit C-MASC in the future. Dr. Baweja is very grateful for her time at C-MASC.



Dr. Baweja at Wooster's No-Tillage Experimental Plots.

Dr. Baweja and others visit the WILDS in Muskingum County, Ohio.





## New Visiting Scholar



**Ricardo de Oliveira Bordonal**

Visiting Scholar – Brazil

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Ph.D Student

The Universidade Estadual Paulista “Júlio de Mesquita Filho” (UNESP, São Paulo State University)

December 2013 – August 2014

## Congratulations!

On February 7, 2014, **André Baldansi Andrade**, a visiting scholar alumni of C-MASC from the Federal University of Lavras, Brazil, defended his BS monography about the topic of SOC, with Dr. Lal as his co-adviser. Award of B.Sc (Honor) degree was approved. Congratulations André!



The University  
of Lavras



**Getulio de Freitas Seben Junior**, a visiting scholar alumni of C-MASC, was recently appointed as a faculty member at UNEMAT, Alta Floresta campus, Brazil, after earning his Ph.D degree from FCAV - UNESP Jaboticabal in 2013. Congratulations Getulio!







## Recent Awards

**Patrick Bell**, OSU Ph.D student and advisee of Dr. Rattan Lal, was recently awarded the prestigious U.S. Borlaug Fellows in Global Food Security Program. Pat plans include continued research and studies in Tanzania during 2014-2015. Pat is shown here in front of Mt. Kilimanjaro in Tanzania during his field research during the summer of 2013. Congratulations and best of luck Pat!

<http://www.purdue.edu/discoverypark/food/borlaugfellows/>



**Nail Moonilall**, OSU Ph.D student and advisee of Dr. Rattan Lal, was recently awarded The 2014 Artist in Landscape Design Scholarship by Fullmer’s Landscaping offers a \$2000 scholarship every two years to a student studying in the horticultural field and attending school in the Tri-State area.

[http://www.onla.org/\\_cclib/attachments/pages/2014\\_Scholarships.pdf](http://www.onla.org/_cclib/attachments/pages/2014_Scholarships.pdf)

**Nail** is a recipient of the 2014 Living Legend Scholarship sponsored by the Miami-Dade FNGLA. <https://www.fngla.org/chapters/Dade/>

**Nail** is also a recipient of this year's GCA Katharine M. Grosscup Scholarship sponsored by the Garden Club of America.

<http://gcamerica.org/scholarships-details.cfm?ScholarshipID=17>

Congratulations Nail!





## In the News...

Dr. Lal was recently featured in an article by Yale e360. The title was "Soil as Carbon Storehouse: New Weapon in Climate Fight?" by Judith D. Schwartz

[http://e360.yale.edu/feature/soil\\_as\\_carbon\\_storehouse\\_new\\_weapon\\_in\\_climate\\_fight/2744/](http://e360.yale.edu/feature/soil_as_carbon_storehouse_new_weapon_in_climate_fight/2744/)



The world's cultivated soils have lost 50 to 70 percent of their original carbon stock.

Dr. Sindhu Jagadamma had a feature article published in Soil Horizons (a SSSA journal) about a snap shot of her 15 years of research. C-MASC and Dr. Lal were kindly mentioned in this article.

<https://www.soils.org/publications/sh/articles/55/1/sh2014-55-1-dl>



Sindhu Jagadamma performing studies at Oak Ridge National Laboratory's Spallation Neutron Source.



## Dr. Lal's Presentations

- Lal, R. 2014. Principles to Practices of Sustainable Soil Management. Global Principles of Sustainable Soil Management, U.N. Headquarters, New York, 28 January 2014.
- Lal, R. 2014. Improving soil quality and adapting to climate change by sustainable soil management. Monty's 2014 Farm Forum, Louisville, KY, 11 February 2014.  
<http://www.montysplantfood.com/2014/03/07/at-farm-forum-growers-get-the-dirt-on-maximizing-soil-health/>
- Lal, R. Soil Resilience and Climate Change. SSSA Ecosystem Services Conference, Sacramento, CA. 6-7 March 2014  
<https://www.soils.org/meetings/specialized-conferences/ecosystem-services>
- Lal, R. Climate Strategic Agriculture. Indian Institute of Soil Science, Bhopal, India. 10-13 March 2014.

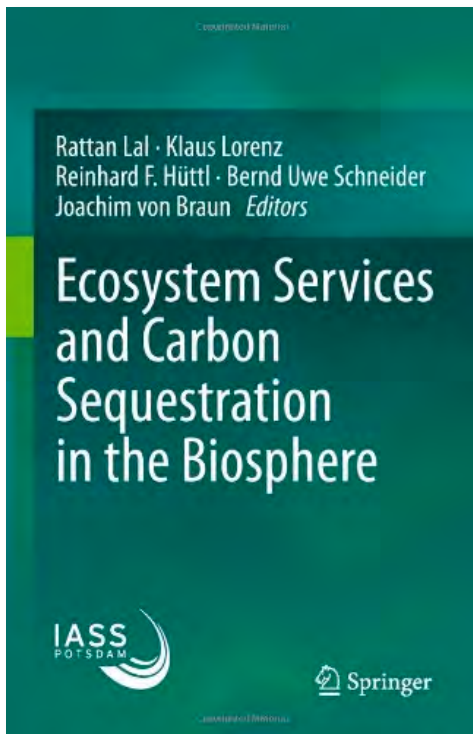




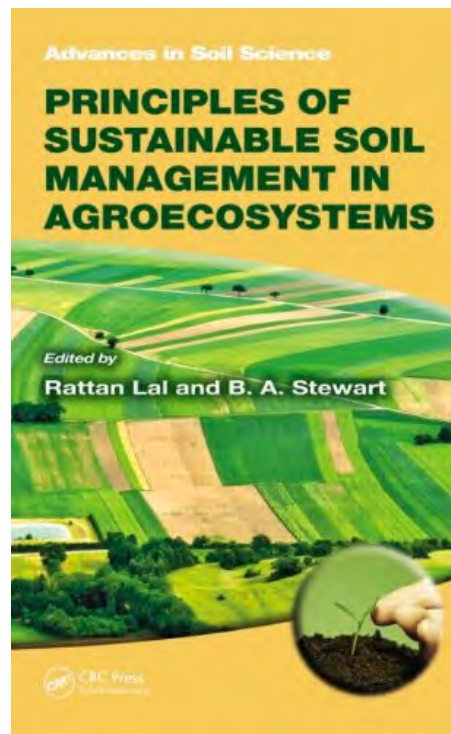


Greetings from the Ilan Stavi family. In Israel, Hebrew style O-H-I-O (right to left) in the Judean Lowlands. Note the snow in the far background (the Judean Highlands). This was the coldest December in Israel during the last two decades, after the warmest November in records.

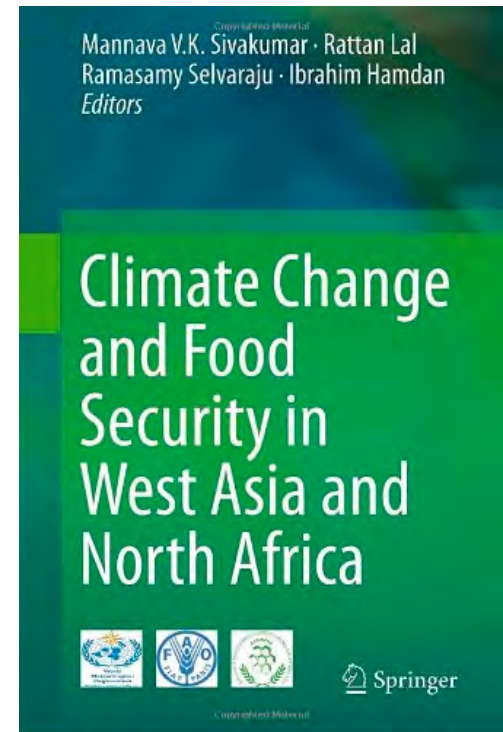
## C-MASC 2013 Books Edited



Lal, R., Lorenz K., Hüttl, R.R.J., Schneider, B.U. and von Braun, J. (Eds). 2013. Ecosystem Services and Carbon Sequestration in the Biosphere. Springer, Dordrecht, Netherlands: 464 pp.



Lal, R. and Stewart, B.A. (Eds). 2013. Principles of Sustainable Soil Management in Agroecosystems. Advances in Soil Sci. Taylor and Francis, Boca Raton, FL. 568 pp.



Sivakumar, M.V.K., Rattan Lal, Ramasamy Selvaraju and Ibrahim Hamdan (Eds). 2013. Climate change and food security in West Asia and North Africa. Springer, Dordrecht, Netherlands: 422 pp.

## C-MASC 2013 Chapters in Multi-Authored Books

- Lal, R. 2013. Principles of Soil Management. In Lal, R. and Stewart, B.A. (Eds). "Principles of Sustainable Soil Management in Agroecosystems". Adv. Soil Sci. Taylor and Francis, Boca Raton, FL. 1-18 pp.
- Zinn, Yuri L., Lal, R. 2013. Principles of Soil Management in Neotropical Savannas: The Brazilian Cerrado. In Lal, R. and Stewart, B.A. (Eds). "Principles of Sustainable Soil Management in Agroecosystems". Adv. Soil Sci. Taylor and Francis, Boca Raton, FL. 57-86 pp.
- Tenywa, Moses M., Zake, Julius Y.K., Lal, R. 2013. Building upon Traditional Knowledge to Enhance Resilience of Soils in Sub-Saharan Africa. In Lal, R. and Stewart, B.A. (Eds). "Principles of Sustainable Soil Management in Agroecosystems". Adv. Soil Sci. Taylor and Francis, Boca Raton, FL. 109-140 pp.
- Qing, Jin, Kong, Xiangbin, Lal, R. 2013. Managing Soil Organic Carbon Concentration by Cropping Systems and Fertilizers in the North China Plain. In Lal, R. and Stewart, B.A. (Eds). "Principles of Sustainable Soil Management in Agroecosystems". Adv. Soil Sci. Taylor and Francis, Boca Raton, FL. 189-202 pp.
- Srinivasarao, Ch., Venkateswarlu, B., Lal, Rattan, Singh, A.K., Kundu, Sumanta, Jakkula, Vijay Sandeep. 2013. Carbon Sink Capacity and Agronomic Productivity of Soils of Semiarid Regions in India. In Lal, R. and Stewart, B.A. (Eds). "Principles of Sustainable Soil Management in Agroecosystems". Adv. Soil Sci. Taylor and Francis, Boca Raton, FL. 423-476 pp.
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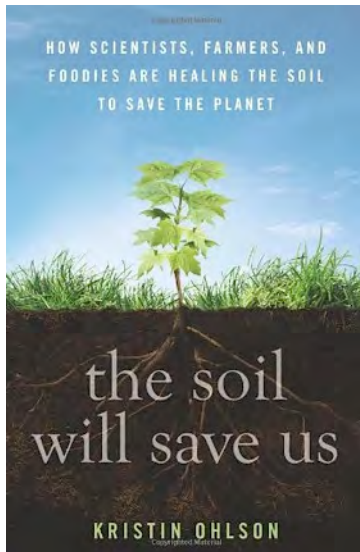
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## A Book Based on the Research of C-MASC...

# *The Soil Will Save Us*



Thousands of years of poor farming and ranching practices—and, especially, modern industrial agriculture—have led to the loss of up to 80 percent of carbon from the world’s soils. That carbon is now floating in the atmosphere, and even if we stopped using fossil fuels today, it would continue warming the planet. In *The Soil Will Save Us*, journalist and bestselling author Kristin Ohlson makes an elegantly argued, passionate case for "our great green hope"—the ancient partnership between plants and soil microorganisms that created our planet and could put that carbon back in the ground.

As the granddaughter of farmers and the daughter of avid gardeners, Ohlson has long had an appreciation for the soil. A chance conversation with a local chef led her to the crossroads of science, farming, food, and environmentalism. She discovered that there is a vast kingdom of creatures under our feet – billions of microorganisms in a tablespoon of soil – that take the carbon dioxide that plants pull from the atmosphere and turn it into life-giving soil carbon. Ohlson introduces the visionary scientists, farmers, foodies, ranchers, and landscapers—whose work shows that earth can be healed and offers the hope that seemingly intractable problems like climate change, air and water pollution, food quality, and even obesity have the same low-tech solution.

"This will surely be called an important book. Ohlson conveys her information in the lively manner of writers such as Michel Pollan and Rowan Jacobsen, making complicated ideas easily accessible to the reader, so that we see the ground at our feet not as dead dirt but rather as, in her words, a "coral reef" teeming with life, a 'massive biological machine' on which the health of our species depends. We're lucky to have this account."—Michael Ruhlman, author of *The Soul of a Chef*

"On the long list of things we have to do to fight climate change, learning to pay attention to soil again is near the top. It's not just dirt, it's not just something that holds plants upright—as this book points out, it's pretty damned vital."—Bill McKibben, author of *Earth: Making a Life on a Tough New Planet*

"I was barely a dozen pages into *The Soil Will Save Us* when I felt the ground shifting under my feet—the literal ground, as in the composition of the rich humus of old-growth forests compared to the exhausted, scorched, and ruined ancient fields of global farming—and the psychic ground.... This is a remarkable book, which tells—with a light touch and a breezy, readable manner—a story of modern science of the most crucial importance."—Melissa Fay Greene, author of *Praying for Sheetrock* and *There Is No Me Without You*

"At last, soil has been included in the conversation about food. And you don't need a degree in soil sciences to see how the web of life below the surface that infuses soil—*is soil*—is strongly affected by the various webs of life that occur aboveground, for better and worse. . . . This book is eminently readable, well-researched, and important."—Deborah Madison, author of *The New Vegetarian Cooking for Everyone* "*The Soil Will Save Us* is a convincing argument that those of us who care about the environment have to start from the ground up—that is, if we are going to give a better world to our grandchildren, we're going to have to develop a deep interest in dirt. Fortunately, all you need to become fascinated by dirt is a book like this, which reveals just how intricate and important it is."—Nathanael Johnson, author of *All Natural*